



IN THE UNITED STATES
PATENT AND TRADEMARK OFFICE

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Patent Application

Inventors: Kai H. Chang et al.
Case: 6-17-28
Application No.: 10/620,068 **Group Art Unit:** 1731
Filed: July 15, 2003
Examiner: Hoffmann, John M
Title: Method and Apparatus for Fabricating Optical Fiber Using Deuterium Exposure

Board of Patent Appeals and Interferences
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450

TRANSMITTAL OF CORRECTED APPEAL BRIEF UNDER 37 C.F.R. § 41.37

SIR:

Responsive to a Notification (PTOL-462) mailed June 15, 2007, please enter the attached Corrected Appeal Brief in the file of the above patent application. Claim 3, which had been improperly canceled in the appeal brief, is no longer canceled.

It is not believed that any additional fees are required. Nevertheless, authorization is hereby given to charge Fitel Deposit Account No. 50-2074 for any fees that applicants may have overlooked.

Respectfully,

Michael A. Morra, Attorney for Applicants
Reg. No. 28975 (770) 798-2040

Docket Administrator - Fitel USA Corp.
2000 Northeast Expressway - Suite 2H-02
Norcross, GA 30071-2906

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as First Class Mail in an envelope addressed to **Mail Stop Appeal Brief - Patents, Commissioner for Patents, P.O. Box 1450, Alexandria VA 22313-1450** on July 2, 2007.

Michael A. Morra



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In Re Application of:)	
)	
K. H. Chang <i>et al.</i>)	Examiner: Hoffmann, J.
)	
Serial No.: 10/620,068)	Art Unit: 1731
)	
Filed: July 15, 2003)	Docket No.: Chang 6-17-28
)	
For: METHOD AND APPARATUS)	Appeal No.: _____
FOR FABRICATING OPTICAL)	
FIBER USING DEUTERIUM)	
EXPOSURE)	

Board of Patent Appeals and Interferences
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450

CORRECTED APPEAL BRIEF UNDER 37 CFR § 41.37

This appeal is taken from a Final Office Action, mailed December 8, 2006, on the above-identified patent application wherein claims 1-8 and 10 (*i.e.*, all claims now pending in the application) were rejected under 35 U.S.C. §112, first and second paragraphs, §102(b) and §103(a). A Notice of Appeal to the Board of Patent Appeals and Interferences was filed by facsimile on March 5, 2007.

(i) REAL PARTY IN INTEREST

The real party in interest is Furukawa Electric North America, Inc. (hereinafter "FENA") by change of name from Fitel USA Corp., having a place of business at 2000 Northeast Expressway, Norcross, GA 30071.

(ii) RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences.

(iii) STATUS OF THE CLAIMS

The claims on appeal are claims 1-8 and 10. Claim 1 is the only independent claim. The status of all claims in the application is as follows:

Claims 1-8 and 10 stand rejected under 35 U.S.C. §§102, 103 and 112.
Claim 9 has been canceled.

(iv) STATUS OF AMENDMENTS

No amendments have been filed subsequent to the final rejection.

(v) SUMMARY OF CLAIMED SUBJECT MATTER

The appellants have invented a method for making optical fiber having low transmission loss at 1385 nanometers (nm) and, more particularly, to a method for limiting any increase in the transmission loss at 1385 nm over the life of the fiber.

Referring to appellants' specification and drawing, the method recited by claim 1 includes the steps of: forming a glass core rod by soot deposition (see paragraph 0021, and step 14 of FIG 1); dehydrating the glass core rod (see paragraph 0022, and step 16 of FIG 1); consolidating the glass core rod to form an optical preform (see paragraph 23, and step 18 of FIG 1); and drawing fiber from the preform, wherein the fiber has a transmission loss at 1385 nm that is less than 0.33 db/km (see paragraphs 0014, 0029; step 22 of FIG 1; and FIG 2B).

The method further recites that the drawn optical fiber is then exposed to an atmosphere containing deuterium at room temperature (see paragraphs 0043 and 0044), and that the partial pressure of the deuterium is between approximately 0.01 atmospheres and 0.05 atmospheres (see paragraphs 0013 and 0044). The time period of deuterium exposure is selected to limit any future hydrogen-aging increase in the transmission loss at 1385 nm to be less than 0.04 db/km (see paragraphs 0014 and 0044).

(vi) GROUND OF REJECTION TO BE REVIEWED ON APPEAL

In the Office action mailed on December 8, 2006, claims 1-8 and 10 were rejected under 35 U.S.C. §102 as being anticipated by U.S. Patent 5,287,427 (*Atkins*); and claims 1-8 and 10 were rejected under 35 U.S.C. §103 as being unpatentable over *Atkins* or U.S. Patent 5,478,371 (*Lemaire*).

Additionally, claims 1-8 were rejected under 35 U.S.C. §112, second paragraph because:

- (i) the term "Si defects" is indefinite as to meaning;
- (ii) the term "room temperature" is indefinite as to meaning; and
- (iii) the phrase "to limit any future hydrogen-aging increase" is indefinite as to meaning.

Finally, claims 1-8 and 10 were rejected under 35 U.S.C. §112, first paragraph because the phrase "to limit any future hydrogen-aging increase" lacks support in the specification for limiting all possible future increases.

(vii) ARGUMENT

35 U.S.C. §102

Claims 1-8 and 10 stand rejected under 35 U.S.C. §102(b) as being anticipated by *Atkins*, which discloses a method for making an optical component that involves exposing the optical waveguide to hydrogen and irradiating at least a portion of the optical waveguide to change the refractive index of the irradiated portion. The Examiner has indicated that, in *Atkins*, the disclosed hydrogen exposure step (at 208 atmospheres) inherently exposes the optical waveguide to naturally occurring deuterium in the hydrogen (0.015%) at a partial pressure of 0.0312 atmospheres ($208 \times 0.00015 = 0.0312$).

This rejection under §102(b) is respectfully traversed because claim 1 specifically requires that the optical fiber have a transmission loss that is less than 0.33 db/km at 1385 nm prior to exposure to a deuterium atmosphere and a

future increase of no more than 0.04 dB/km thereafter (*i.e.*, a maximum lifetime loss, which is less than 0.37 dB/km).

It is noted that although claim 1 recites transmission loss at 1385 nm and *Atkins* discloses transmission loss at 1390 nm, appellants are not using this minor difference as a basis for distinction. Rather, appellants respectfully submit that exposing a drawn optical fiber to 208 atmospheres of hydrogen, as disclosed in *Atkins*, will have an effect that is opposite to what is required by claim 1. More specifically, the loss in non-exposed regions of *Atkin's* fiber is 0.001 dB/cm (*i.e.*, 10 dB/km), which is nearly 2 orders of magnitude greater than appellants' required loss of 0.33 dB/km (*Atkins*, at col. 7, line 68). And exposing *Atkins* fiber to an atmosphere containing hydrogen having an inherent concentration of deuterium of only 0.015% assures that hydrogen, rather than deuterium, will primarily fill the Si-defect sites. Not surprisingly, in *Atkins*, optical loss at 1390 nm in the treated area is > 0.1db/cm (*i.e.*, >10,000 dB/km), which is more than 4 orders of magnitude greater than the applicants' recited optical loss at 1385 nm of 0.37 db/km (*Atkins*, at col. 7, line 64).

In summary, whereas claim 1 requires that optical transmission loss at 1385 nm be less than 0.33 db/km prior to deuterium exposure, the fiber disclosed in *Atkins* has an optical transmission loss of 10 db/km prior to exposure. And whereas claim 1 requires that after deuterium exposure, optical transmission loss at 1385 nm be less than 0.37 dB/km (*i.e.*, 0.33 dB/km + 0.04 dB/km), the fiber disclosed in *Atkins* has a transmission loss increase of 10,000 db/km after exposure. Accordingly, at no time does *Atkins'* fiber come within the transmission loss requirements of claim 1, and it is respectfully requested that the rejection under §102(b) be reversed.

35 U.S.C. §103

Claims 1-8 and 10 stand rejected under 35 U.S.C. §103(a) as being unpatentable over *Atkins* or U.S. Patent 5,478,367 (*Lemaire*).

With respect to *Lemaire*, a method for making a Bragg grating is disclosed in which hydrogen or deuterium exposure enhances the effect of UV radiation for increasing the index of refraction of portions of the grating. The pressures recited by *Lemaire* are in the range 14 – 11,000 psi (*i.e.*, 1 – 750 atmospheres). In contrast, all claims of the present invention require that the partial pressure of deuterium be between approximately 0.01 and 0.05 atmospheres.

Nevertheless, the Examiner states that *Lemaire* discloses a hydrogen pressure, which would have an inherent partial pressure of 0.066 atmospheres of deuterium-containing molecules, and that 0.066 is deemed to be "between approximately 0.01 and 0.05 atmospheres." The Examiner calculates that this partial pressure of deuterium is present in a high pressure hydrogen environment because deuterium has an inherent concentration of 0.015% in a hydrogen atmosphere. Applicants agree with the Examiner that a partial pressure of 0.066 atmospheres is included in the recitation of "approximately 0.01 and 0.05 atmospheres." However, the exposure of optical fiber to an environment containing 99.985% hydrogen and 0.015% deuterium would cause the same increase in transmission loss at 1385 nm as discussed above in connection with *Atkins*. Namely, exposing an optical fiber to an atmosphere containing such a concentration of hydrogen assures that hydrogen, rather than deuterium, primarily fills the Si-defect sites and produces the exact opposite result required by claim 1.

The Examiner has dismissed appellants' arguments regarding *Lemaire* as being irrelevant because, according to the Examiner's reading of claim 1, limiting any future increase to be less than 0.04 dB/km begins immediately after deuterium treatment. Therefore, one could expose the fiber to an extraordinary high level of hydrogen, and incidentally increase the loss at 1385 nm by several orders of magnitude, so that after such exposure the loss increase due to hydrogen aging would be less than 0.04 dB/km. This would be a

bizarre thing to do in a situation where low transmission loss at 1385 nm is desirable. Claim 1 clearly requires that prior to deuterium treatment, optical transmission loss is less than 0.33 db/km at 1385 nm, and that after deuterium treatment, optical transmission loss is forever less than 0.37 dB/km (*i.e.*, 0.33 dB/km + 0.04 dB/km) at 1385 nm.

As asserted hereinabove, at no time does *Atkins'* fiber come within the transmission loss requirements of claim 1. Consequently, at no time does *Lemaire's* fiber come within the transmission loss requirements of claim 1 because it is the very same fiber disclosed in *Atkins*. In support of this assertion, reference is made to *Atkins*, wherein the only optical fiber disclosed is AT&T's 5D fiber (see *Atkins* at col. 3, lines 41 and 66; and col. 4, line 68). Reference is also made to *Lemaire*, wherein the only optical fiber disclosed is AT&T's 5D fiber (see *Lemaire* at col. 4, line 60; col. 5, lines 14, 31, 54; and col. 6, line 23). This should not be surprising because these patents both share a common parent, namely U.S. Patent No. 5,235,659.

Accordingly, the notion of exposing an optical fiber (whose initial transmission loss is nearly 2 orders of magnitude greater than 0.33 db/km (required by the present invention) to high pressure hydrogen, which increases optical transmission loss by another 3 orders of magnitude cannot possibly render claim 1 unpatentable under 35 U.S.C. §103(a).

The only remaining argument asserted by the Examiner is that "it would have been obvious to make standard fibers with as low of loss as possible." What the Examiner appears to be saying is that starting with an optical fiber whose transmission loss at 1385 nm is less than 0.33 db/km, it would have been obvious to expose it to a high pressure hydrogen environment. Immediately thereafter (perhaps one second or less) the transmission loss would have increased by less than the amount required by claim 1 (0.04 db/km). Therefore the requirement of claim 1 would be satisfied; namely, that any future hydrogen-aging increase in transmission loss at 1385 nm would be less than 0.04 db/km. The Examiner appears to be interpreting claim 1 as applying to fibers whose transmission loss is greater than 0.37 db/km after treatment even though the

transmission loss of the fiber might never increase by more than 0.04 dB/km/km after exposure in the future. This argument fails at several levels:

- (1) Claim 1 clearly requires that prior to deuterium treatment, optical transmission loss be less than 0.33 dB/km at 1385 nm; and that after deuterium treatment, optical transmission loss be forever less than 0.37 dB/km at 1385 nm (*i.e.*, 0.33 dB/km + 0.04 dB/km).
- (2) As discussed above, even before high-pressure hydrogen treatment is undertaken in *Atkins* or *Lemaire* for different reasons, optical transmission loss exceed 0.33 dB/km. *Atkins* and *Lemaire* both disclose AT&T's 5D fiber, whose loss at 1385 nm is about 10 dB/km.
- (3) During exposure to high-pressure hydrogen (*i.e.*, an atmosphere that contains 99.985% hydrogen and 0.015% deuterium), hydrogen atoms (not deuterium atoms) overwhelmingly occupy and silicon-defect sites. It is apparent that the transmission loss increases during exposure as the silicon-defect sites are filled by hydrogen atoms. However, one seeking optical transmission loss, which is forever less than 0.37 db/km at 1385 nm, would never subject the fiber to a high pressure hydrogen environment as disclosed in *Atkins* or *Lemaire* because such treatment demonstrably causes optical transmission loss to be greater 10,000 db/km!!

35 U.S.C. §112, Second Paragraph

The Examiner has rejected claims 1-8 and 10 under 35 U.S.C. §112, second paragraph because various terms were deemed to be indefinite.

Si-defects

The Examiner has rejected claim 3 as being indefinite for failing to particularly point out and distinctly claim the subject matter that the applicants regard as the invention. More specifically, the Examiner indicates that the term "Si defects" is indefinite as to its meaning. Initially, the Examiner indicates that there is no definition for the term "Si defects." The applicants respectfully note

that that the term is explained with sufficient clarity in the applicants' specification. As discussed in the applicants' paragraph [0010], silicon defects are one of various defects in an optical fiber that react with hydrogen. Additionally, paragraph [0012] identifies certain specific silicon defects Si-O and Si-. When such defects react with hydrogen (undesirable) or deuterium (desirable) they are no longer considered "defects." As discussed above, reaction with hydrogen undesirably leads to increased optical transmission loss at 1385 nm whereas reaction with deuterium does not.

Secondly, the Examiner states that paragraph [0042] of the applicants' specification "discloses that the treatment does not reduce the number of defects, rather it seems to convert them to less harmful defects." The applicants respectfully disagree with such a conclusion. The applicants submit that it is clear from reading the cited paragraphs [0010] that SiD is not a defect because it is no longer free to react with hydrogen. Moreover, SiH is not a defect either. However, the present invention is directed to reacting silicon defects with deuterium to preclude their subsequent reaction with hydrogen.

Room Temperature

The Examiner has stated that the term "room temperature" is indefinite as to its meaning, and cites the everything2.com website for the proposition the room temperature can be from -10° C to 50° C. However, the everything2.com website also states that physicists usually consider room temperature to be between 21° C and 23° C, and that European chemical data sheets list properties of material at 25° C. Moreover, the everything2.com website states that "Room temperature refers to the temperature of what is considered to be a 'normal' room. The possibility that *your* room may be just above freezing or a sauna is **irrelevant**" (boldface emphasis added). Accordingly, the Examiner's position that room temperatures comprise -10° C (below freezing) and 50° C (above sauna) is not what one of ordinary skill in the art would consider to be a 'normal' room, and is not even supported by the everything2.com reference cited by the Examiner (see **EXHIBIT A**).

Appellants submit that the term "room temperature" is not indefinite and is generally understood to cover the range 20 to 25° C as indicated by evidence submitted herewith. For example the Condensed Chemical Dictionary, Ninth Edition, defines room temperature as "an interior temperature from 20 to 25° C (68 to 77° F)" (see **EXHIBIT B**). In Wikipedia, the free encyclopedia, the range 20 to 25° C is generally considered to be room temperature; although comfortable winter and summer room temperatures in rural areas of 16° and 27° C are also mentioned. The Answers.com website approvingly cites the Wikipedia definition of room temperature and further indicates that *The American Heritage® Dictionary* defines room temperature as "[a]n indoor temperature of from 20 to 25 C (68 to 77° F) (see **EXHIBIT C**).

Any Future Hydrogen-Aging

The Examiner has stated that "[t]he phrase 'to limit any future hydrogen-aging increase' is indefinite as to whether it means that it limits at least one increase - or that it means that there is no manner in which there can be such an increase."

Appellants respectfully submit that claim 1 is not indefinite. Claim 1 requires that after deuterium treatment, transmission loss at 1385 nm will never be greater than 0.37 dB/km (*i.e.*, 0.33 dB/km initially + 0.04 dB/km attributable to hydrogen aging), and it applies to the entire lifetime of the optical fiber – be it a nanosecond or 40 years. As stated in paragraph 0030 of the specification, hydrogen-aging loss refers to the increase in loss during the lifetime of the optical fiber – and its lifetime begins before deuterium treatment. Nevertheless, to the extent that the claim language is unclear, paragraphs 0014, 0044 and 0046 of the specification state that the "loss increase thereafter is less than 0.04 dB/km." The word "thereafter" clearly applies to any time after its initial loss at 1385 nm was 0.33 dB/km, or less. Indeed, the fundamental teaching of the patent application is that silica glass used in making optical fiber typically has internal defect sites (*i.e.*, Si-defects). If these defect sites are filled by hydrogen atoms, then there will be an undesirable increase in optical transmission loss at 1385 nm. However, if we fill these defect sites with deuterium atoms shortly after

the fiber is manufactured, then the defect sites are not subsequently available to hydrogen atoms, and the increase in optical transmission loss at 1385 nm beyond the initial transmission loss of 0.33 dB/km will be less than 0.04 dB/km over the lifetime of the optical fiber. Accordingly, the phrase "to limit any future hydrogen-aging increase" is not indefinite.

In view of the above remarks and evidence, appellants submit that claims 1-8 and 10 are not indefinite, and it is respectfully request that the Examiner's rejection under 35 USC §112, second paragraph, be reversed.

35 U.S.C. §112, First Paragraph

The Examiner has rejected claims 1-8 and 10 under 35 U.S.C. §112, first paragraph, as failing to comply with the written description requirement. In particular, the Examiner has stated that the phrase "to limit any future hydrogen-increase in transmission loss ..." lacks support in the specification for limiting all possible future increases. The Examiner states that "[j]ust because applicant used the fiber in a particular environment for a particular length of time and got a loss increase that was no more than 0.04 dB/km, it does not reasonable follow that the fiber could not have a greater loss with some other environment, for an extreme example, in 300 atm of hydrogen, at 800° C for 40 years."

Appellants have not measured the hydrogen-aging loss increase in a deuterium-treated optical fiber in 300 atm of hydrogen, at 800° C for 40 years and are unable to comment on the Examiner's extreme example. However, the Examiner could just as easily have raised the temperature in his example to be above the melting point of glass in order to make the same point regarding the scope of the word "any."

However, the present invention deals with fibers that are designed for commercial use, and it should be understood that the term "any future hydrogen-aging increase in transmission loss" encompasses the most severe environments in which optical fibers are designed to operate, but not those that are ridiculously beyond the realm of commercial experience. For example, FENA's most robust protective coating for glass optical fiber comprises

polyimide, which itself decomposes at about 550° C. FENA's optical fiber product having the highest-rated operating temperature is designated "GeoFiber," which has a polyimide coating but is only recommended for temperatures up to 300° C (see **EXHIBIT D**). And even though 300° C is a very high temperature, it is far too low to cause hydrogen atoms to replace deuterium atoms, even in a high pressure hydrogen environment. Moreover, appellants assert that 300 atm of hydrogen is not a contemplated environment for commercial usage.

For the extensive reasons advanced above, Appellants respectfully but forcefully contend that each of claims 1-8 and 10 are patentable. Therefore, appellants respectfully request that the Examiner's FINAL rejection of these claims be reversed by the Board and that the application be allowed to issue.

Respectfully,

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D. Kalish

T. J. Miller

By 

Michael A. Morra - Attorney for Appellants

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Furukawa Electric North America, Inc.

Date: July 2, 2007

APPENDICES

(viii) CLAIMS APPENDIX

1. A method for making optical fiber, the method comprising the steps of:
forming a glass core rod by soot deposition, the glass core rod having a core region surrounded by a cladding region;
dehydrating the glass core rod;
consolidating the glass core rod to form an optical fiber preform;
drawing fiber from the optical fiber preform, wherein the drawn optical fiber has a transmission loss at 1385 nm that is less than 0.33 db/km; and
exposing the drawn optical fiber to an atmosphere containing deuterium at room temperature, wherein the partial pressure of deuterium is between approximately 0.01 and 0.05 atmospheres, and wherein the drawn optical fiber is exposed to the atmosphere containing deuterium for a time period that is sufficient to limit any future hydrogen-aging increase in transmission loss at 1385 nm to less than 0.04 db/km.
2. The method as recited in claim 1, wherein the [exposing step further comprises exposing the drawn optical fiber to a deuterium atmosphere having a] partial pressure of deuterium is approximately 0.01 atmospheres and the time period is approximately 6 days.
3. The method as recited in claim 1, wherein the exposing step further comprises exposing the drawn optical fiber to a deuterium atmosphere in such a way that reduces the amount of Si defects in the fiber.
4. The method as recited in claim 1, further comprising the step of forming an overclad region around the glass core rod to form an overclad optical fiber preform, and wherein the drawing step comprises drawing fiber from the overclad optical fiber preform.
5. The method as recited in claim 4, wherein the overclad region forming step comprises the steps of:
depositing soot around the glass core rod;

dehydrating the deposited soot; and
consolidating the deposited soot around the glass core rod.

6. The method as recited in claim 5, wherein the soot deposition in the overclad region forming step is selected from the group consisting of vapor axial deposition (VAD) and outside vapor deposition (OVD).

7. The method as recited in claim 4, wherein the overclad region forming step comprises the steps of:

positioning an overclad tube around the glass core rod; and

heating the overclad tube along the length thereof in such a way that the overclad tube collapses onto the glass core rod to form the overclad optical fiber preform.

8. The method as recited in claim 1, wherein the soot deposition in the glass core rod forming step is selected from the group consisting of vapor axial deposition (VAD) and outside vapor deposition (OVD).

10. The method as recited in claim 1, wherein the partial pressure of deuterium is approximately 0.05 atmospheres and the time period is approximately 1.5 days.

(ix) **EVIDENCE APPENDIX**

EXHIBIT A: Reference cited by Examiner regarding "Room Temperature"
From the everything₂ website.

EXHIBIT B: Reference cited by Appellants regarding "Room Temperature"
From the Condensed Chemical Dictionary

EXHIBIT C: Reference cited by Appellants regarding "Room Temperature"
From the Answers.com™ website

EXHIBIT D: Specification sheet for **GeoFibers**

(x) **RELATED PROCEEDINGS APPENDIX**

(None)

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EXHIBIT A

Ads t

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? 3 C!s

Fri Sep 02 2005 at 23:14:19

Room temperature refers to the temperature of what is considered to be a 'normal' room. The possibility that *your* room may be just above freezing or a sauna is irrelevant.

Physicists usually consider room temperature to be between 21°C and 23°C (294 to 296 Kelvin or 70°F to 74°F), with the implicit assumption that the room's air pressure is close to standard pressure. In practice, many physics experiments are not particularly temperature sensitive — in a laboratory report, "at room temperature" usually means "no effort was made to control the temperature because it is not considered to be a significant source of experimental error".

The standard room used by chemists can be slightly warmer. Many European chemical data sheets list properties of materials at 25°C (298K or 77°F) and one atmosphere. Again, though, "at room temperature" implies a lack of specific temperature controls beyond, perhaps, basic air conditioning or a radiator on a thermostat.

When it comes to wine, things get considerably trickier. It is well known that most red wine should be served at room temperature. However, the room in question here is not your kitchen or dining room; rather, it refers to the temperature of your wine cellar. The archetypical wine cellar is underneath the house, has stone walls and is not directly heated to the same degree as rooms that are for living.

To complicate things further, different grapes and styles of wine are best stored and served at different temperatures. For Bordeaux reds and higher quality new world wines made from merlot or shiraz / syrah, 'room temperature' is around 18°C. For Burgundy reds and lighter new world wines, it is between 15°C and 17°C. For Anjou and Beaujolais reds, room temperature can be as low as 12°C.

For food, room temperature is the temperature reached by food when it has been left to stand for a length of time, often after either cooling or heating. A good metric is chocolate-based desserts. If they melt, your room is probably too warm; if they are hard and crunchy, your room may be too cold.

For those making toys, furniture or other household goods, room temperature must cover a far broader range. Realistically, a household room could be anywhere from ten degrees below freezing up to around 50°C. Many safety standards require that a product does not melt, catch fire, explode, shatter or otherwise suffer damage throughout this temperature range.

Room temperature should not be confused with ambient temperature, which is even less specific. Ambient temperature can be used when conducting experiments outdoors in mild climates — again, the assumption is that the experiment in question is not particularly temperature sensitive.

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Quick-chilling a case of beer

ambient temperature

in the dark humming hours of the night

summer berry pudding

Somerset Brie

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temperature

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Sell Heal Holler (essay)

Jack
So, I bought some new curtains. They're blue, and that act is symbolic of the hopelessness of my particular domestic situation. (person)

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EXHIBIT B

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Coauthor, Glossary of Chemical Terms



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"Rodine."³⁴² Trademark for red squill liquid extract rodenticides.

"Rodo."⁶⁹ Trademark for a series of blended essential oils used to deodorize rubber.

Roentgen, W. K. (1845-1923). German physicist who discovered x-rays in 1895 for which he was awarded the Nobel Prize in 1901. Application of these to a number of important problems in analytical chemistry was developed by the Braggs, Moseley, von Laue, and Debye and Sherrer.

roentgen (r). The international unit of quantity or dose for both x-rays and gamma rays. It is defined as the quantity of x- or gamma rays which will produce as a result of ionization one electrostatic unit of electricity of either sign in 1 cc (0.001293 g) of dry air as measured at 0°C and standard atmospheric pressure. The use of the roentgen unit has been extended to include particle radiation such as alpha and beta particles and protons and neutrons. See also rad, curie.

Rohrhaach solution.

Properties: Clear, yellow liquid. Very refractive; sp. gr. 3.5.

Derivation: An aqueous solution of mercuric barium iodide.

Hazard: Highly toxic by ingestion and inhalation.

Uses: Separating minerals by their specific gravity; microchemical detection of alkaloids.

"Romark."⁴⁴⁸ Trademark for alkyd and chlorinated rubber type road-marking paints.

ronnel. Generic name for O,O-dimethyl O-(2,4,5 trichlorophenyl) phosphorothioate, $(CH_3O)_2P(S)OC_6H_2Cl_3$.

Properties: Powder or granules; m.p. 41°C. Insoluble in water; soluble in most organic solvents.

Hazard: Toxic by ingestion and inhalation. Tolerance, 10 mg per cubic meter of air. Cholinesterase inhibitor. Use may be restricted.

Use: Pesticide.

Shipping regulations: (Rail, Air) Organic phosphate, solid, n.o.s., Poison label. Not accepted on passenger planes.

"Ronopole" Oil.¹⁶⁵ Trademark for highly oxidized sulfonated castor oil.

room temperature. An interior temperature from 20 to 25°C (68 to 77°F).

"Roracyl."²⁸ Trademark for a group of soluble dyes that have good affinity and fastness properties on leather.

"Rosaldehyde."¹⁸⁸ Trademark for a synthetic floral perfume base.

rosaniline $HOC(C_6H_4NH_2)_2C_6H_3(CH_3)NH_2$. A triphenylmethane dye.

Properties: Reddish brown crystals; m.p. 186°C (dec).

Soluble in acids and alcohol; slightly soluble in water.

Hazard: May be toxic.

Uses: Dye (usually as the hydrochloride); fungicide.

"Rosanlik."¹⁸⁸ Trademark for a synthetic replacement of otto of rose.

roscoelite $K_2V_4Al_2Si_8O_{20}(OH)_4$. A vanadium-bearing species of mica (q.v.). Formula variable, with V_2O_5 up to 28%. Occurs as minute scales with micaceous cleavage; dark green to brown in color; pearly luster. Mohs hardness 2.5; sp. gr. 3.0.

Occurrence: Colorado, California, Australia.

Use: Source of vanadium.

rose absolute. Pure oil of rose. The first filtrate obtained on separation of waxes from the cooled alcohol solution of rose concrete in perfume manufacture.

rose concrete. Semisolid residue, a mixture of essential oils and waxes, resulting from extraction of rose flower petals, leaves, seeds, fruit, roots, gums or bark by means of a volatile solvent.

rose oil (otto of rose oil; attar of roses; rose flower oil) Properties: Pale yellow, pale green, or pale red, transparent, essential oil; mild, sweet taste; strong, fragrant odor; semi-solid at room temperature. Sp. gr. 0.845-0.865; solidifying point 18-37°C; saponification value 10-17; acid value 0.5-3; refractive index (n_D 20) 1.457-1.463. Combustible; nontoxic.

Chief constituents: Geraniol, citronellol and phenyl-ethyl alcohol.

Derivation: By steam distillation of the fresh flowers of *Rosa damascena*, *Rosa centifolia*, *Rosa galica* and *Rosa alba*.

Grades: Bulgarian; French; Turkish; N.F.; F.C.C.

Uses: Perfumes; flavoring.

"Rosetone."¹⁹ Trademark for trichloromethylphenyl-carbinyl acetate (q.v.).

rosewood oil. See oil bois de rose.

rosin

Properties: Angular, translucent, amber-colored fragments; sp. gr. 1.08; m.p. 100-150°C; acid no. not less than 150. Flash point 370°F. Insoluble in water; freely soluble in alcohol, benzene, ether, glacial acetic acid, oils, carbon disulfide, dilute solutions of fixed alkali hydroxides. Low toxicity. Hard and friable at room temperature; soft and very sticky when warm. Combustible.

Chief constituents: Resin acids of the abietic and pimaric types, having the general formula

$C_{10}H_{16}COOH$, and having a phenanthrene nucleus.

See also turpentine.

Derivation: From pine trees, chiefly *Pinus palustris* and *Pinus caribaea*. (a) Gum rosin is the residue obtained after the distillation of turpentine oil from the oleoresin tapped from living trees. (b) Wood rosin is obtained by extracting pine stumps with naphtha and distilling off the volatile fraction. (c) Tall oil rosin is a byproduct of the fractionation of tall oil (q.v.).

Grades: Virgin; yellow dip; hard; N.F. Wood rosin is grades B, C, D, E, F, FF, G, H, I, J, K, L, M, N, W-G (window-glass), W-W (water-white). The grading is done by color, B being the darkest and W-W the lightest.

Containers: Drums; multi-wall paper bags.

Uses: Hot-melt and pressure-sensitive adhesives; mastics and sealants; varnishes; ester gum; soldering compounds; core oils; insulating compounds; soaps; paper sizing, printing inks; polyesters (formed by reaction of the conjugated acids of rosin with acrylic acid, followed by reaction with a glycol). See also abietic acid.

rosin oil.

Properties: Water-white to brown liquid; viscous; odorless; strong, peculiar taste. Soluble in ether, chloroform, fatty oils and carbon disulfide; slightly soluble in alcohol; insoluble in water. Essentially decarboxylated rosin acids. Sp. gr. 0.980-1.110; iodine number 112-115.

Derivation: By fractional distillation of rosin, that portion distilling above 360°C being rosin oil.

Containers: Drums; tank cars.

Hazard: Spontaneous heating; fire risk when heated.

Answers.com™

EXHIBIT C

room temperature

Dictionary

The American Heritage
dic·tion·ar·ies

room temperature

n. (Abbr. RT)

An indoor temperature of from 20 to 25°C (68 to 77°F).

WordNet



Note: click on a word meaning below to see its connections and related words.

The *noun* room temperature has one meaning:Meaning #1: the normal temperature of room in which people live

Wikipedia



room temperature

Room temperature describes a certain temperature within enclosed space that is used for various purposes by human beings. It can also refer to a temperature of food to be consumed (e.g. red wine) which is placed in such a room for a given time. Furthermore, it may refer to a certain temperature within settings of scientific experiments and calculations.

Human comfort and health

For human comfort, desirable room temperature greatly depends on individual needs and various other factors. While one person may prefer a room that is 17 °C (63 °F), another person may prefer it to be 27 °C (81 °F). For example, a study on health and room temperature carried out in Shandong (China) by Meng (1990)^[1] found that in rooms of single story houses in rural areas during *winter* the comfortable room temperature ranged between 16-20 °C (61-68 °F), whereas during *summer* the range was between 26-27 °C (79-81 °F). According to the West Midlands Public Health Observatory (UK)^[2], 21 °C (70 °F) is the recommended living room temperature with a maximum of 24 °C (75 °F), whereas 18 °C (64 °F) for bedroom temperature. A study carried out at the University of Uppsala (Sweden)^[3], on indoor air quality and subjective indoor air quality (SIAQ) in primary schools, states that perception of high room temperature was related to a poor climate of cooperation. To achieve a good SIAQ, it recommends room temperature should be at a maximum of 22 °C (72 °F).

The desire for a particular temperature can be affected by many factors, including: weather, clothing,

ventilation, sunlight, time of day, illness (e.g. fever); heat from baths or showers, hot food or drinks, exercise, and cooking.

According to ASHRAE (American Society of Heating, Refrigerating and Air Conditioning Engineers), thermal comfort is a *state of mind*. Key findings of studies (c.f. Fanger et al), which led to the development and refinement of ASHRAE Standard 55, stated that not everyone within the same room was satisfied by a particular set of indoor environmental conditions, but in certain ranges of conditions a vast majority expressed satisfaction. In addition to the so-called operative temperature, thermal comfort depends on other environmental conditions (e.g. air velocities, humidity, differences in air temperatures between foot and head level, or levels of rapid temperature changes across space and time).

Scientific calculations

*|

For scientific calculations, room temperature is taken to be roughly 20 to 25 degrees Celsius ($^{\circ}\text{C}$) (About 72.5 degrees Fahrenheit ($^{\circ}\text{F}$), 528 to 537 degrees Rankine ($^{\circ}\text{R}$), or 293 to 298 kelvins (K))^[4]. For numerical convenience, either 20 $^{\circ}\text{C}$ or 300 K is often used. However, room temperature is *not* a precisely defined scientific term as opposed to Standard Temperature & Pressure.

Condition for physical experiments

The progress and results of many scientific and industrial processes depends little or not at all on the temperature of the surroundings of the equipment. For example, a measurement of the charge of the electron does not depend upon the temperature of the test equipment. In such cases if any mention of temperature is made, it is customary and sufficient to speak simply of "room temperature", which essentially implies simply that what is being spoken of has not been specifically heated or cooled. Usually this means a temperature at which many people are comfortable, around 20 $^{\circ}\text{C}$. In most cases considerable temperature variations are irrelevant; work may be carried out in winter or summer without heating or air-conditioning, without mention of the temperature. However, productivity is dependent on thermal comfort.

*|

The phenomena that researchers may choose to study at room temperature can naturally occur in the range of 20 to 25 $^{\circ}\text{C}$, or they may not. Researchers will choose to study a process outside its natural temperature range when they expect the conclusions to a specific question to be the same at room temperature as at a more natural temperature.

Experimentalists have an advantage in anticipating aspects of a room-temperature experiment, because the temperature is close to 25 $^{\circ}\text{C}$ (77 $^{\circ}\text{F}$, 537 $^{\circ}\text{R}$, 298 K), at which many of the material properties and physical constants in standards tables have been measured (more at standard state). By consulting such tables a researcher may estimate, for example, how fast a chemical reaction is likely to proceed at room temperature.

Unless there is a reason to work at a specific temperature, it is clearly more convenient not to control the temperature. Even in cases where a known, controlled, temperature is advantageous but not essential, work may be carried out at room temperature. But, for example, very large, warehouse-type experimental facilities may lack sufficient heating and cooling capabilities to maintain 'room temperatures'.

*|

If it is believed that work which may have some dependence upon temperature has been carried out at temperatures significantly outside the range 20 to 25 $^{\circ}\text{C}$, it may be reported that it was carried out at an ambient temperature of some approximate specified value.

An assumed typical ambient temperature may be used for general calculations; for example, the thermal efficiency of a typical internal combustion engine may be given as approximately 25%, with no mention of the air temperature: the actual efficiency will depend to some extent on ambient temperature, decreasing in extremely hot weather conditions due to lower air density.

Ambient vs. room temperature

Being a less precise specification than even "room temperature", "ambient temperature" is more certain to be accurate. Because scientists strive for accuracy in their reports, many use this specification exclusively just as a matter of course, even to describe experiments that they could justifiably characterize as having been conducted at room temperature.

This is a nebulous issue, depending upon the language used. In many languages, for example Spanish, there is no expression for "room", as distinct from "ambient", temperature.

Arguably, no precision is lost in this practice: In disciplines where experimenters always work in laboratories, and where temperature differences of a few degrees make little difference with regard to the questions that scientists ask, the distinction between ambient and room temperature literally is not worth making. And, of course, the ambient temperature of a room is usually room temperature.

Yet small temperature differences have large effects on many natural processes. Therefore scientists who do observe a distinction between the two specifications may be sticklers about which one to apply. For example, heat given off by electronics or motors may warm the area around an experiment relative to the rest of a room. Under such circumstances, and depending on the question under investigation, some scientists would consider it inaccurate to report that an experiment took place at room temperature.

References

1. [^]

Zhonghua Yu Fang Yi Xue Za Zhi. [Chinese Journal of Preventive Medicine] 1990 [Studies on the health standard for room temperature in cold regions] Vol.24(2): pp. 73-6.[1]

2. [^] Why more people die in the winter, by Michelle Roberts, Health reporter, BBC News [2]

3. [^] Dan Norbäck (1995) Subjective Indoor Air Quality in Schools - The Influence of High Room Temperature, Carpeting, Fleecy Wall Materials and Volatile Organic Compounds (VOC) Indoor Air 5(4), 237-246. [3]

4. [^] The American Heritage® Dictionary of the English Language, Fourth Edition.

See also

- Temperature
- Psychometrics — the study of moist air
- Standard Temperature & Pressure (STP)

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SPECIALTY SINGLE-MODE FIBER**Specification Sheet****GeoFibers****GEO 1310 11 AND GEO 1310 16**

Leading Optical Innovations

Product Description

Single-mode GeoFibers are designed for use in geophysical applications at the dual wavelengths of 1310/1550 nm. They are offered with two different numerical apertures (NA) of 0.11 and 0.16. In general, fibers with higher NA have enhanced optical bend performance. The 0.11 NA is the standard for fibers deployed linearly and the 0.16 fiber performs well in coiled sensors or inside sensors with small bend radii. OFS is vertically integrated and manufactures fiber preforms using the OFS patented MCVD process. GeoFibers are protected with the dual carbon/polyimide coating system for optimal performance in down-hole deployment.

Ask us about options available for these fibers:

- ☒ **Cabling**
- ☒ **Connectorization**
- ☒ **Metalization**
- ☒ **Additional Coatings**
- ☒ **Other Upgrades**

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www.SpecialtyPhotonics.com**EXHIBIT D**

Primary Coating. Years of highly specialized experience and research have gone into designing these optical fibers and applying the customized coating combinations that enable their use in harsh environments. The first line of defense is a very thin primary coating of carbon that chemically bonds with the glass to provide a hermetic seal against moisture at all temperatures. Carbon dramatically extends the lifetime of the fiber by stopping fiber "fatigue" (crack growth activated by water vapor). Carbon has the additional feature of providing a barrier against H₂ ingress at temperatures up to 130°C.

Secondary Coatings. OFS recommends a secondary coating of PYROCOAT polyimide, a high-temperature material that allows fiber to perform in environments ranging up to 300°C. It is applied in a thin, continuous coating during the draw process and gives the fiber an outer diameter (OD) of only 155 µm.

Typical Applications

- Data links
- Single-mode sensors
- Down-hole deployment
- Above-ground well networking
- Raman back-scattering

Features and Benefits

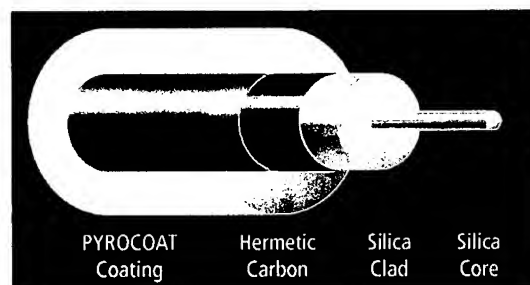
- Tough glass for harsh environments
- Wavelength performance at both 1310 and 1550 nm
- Choice of NAs: 0.11 and 0.16
- High survivability in water, high temperatures, high pressure, and active chemical environments
- Abrasion resistant
- Long lengths up to 14 km

Related Products & Capabilities

- See our full line of ClearLite Specialty Coated fibers in a variety of wavelengths.
- Other fibers are available at 1310 nm wavelength without specialty coatings.

Fiber Specifications

Optical Properties	GEO 1310 11	GEO 1310 16
Operating wavelength	1310/1550 nm	1310/1550 nm
Cutoff wavelength	≤ 1290 nm	≤ 1290 nm
Mode field diameter @ 1310 nm	9.3 ± 0.5 μ m	6.7 ± 1.0 μ m
Mode field diameter @ 1550 nm	10.5 ± 1.0 μ m	7.5 ± 1.0 μ m
Attenuation @ 1310 nm	≤ 0.7 dB/km	≤ 0.8 dB/km
Attenuation @ 1550 nm	≤ 0.6 dB/km	≤ 0.6 dB/km
Numerical aperture (nominal)	0.11	0.16
Dimensions/Geometric Properties		
Core diameter (nominal)	8.4 μ m	6.3 μ m
Clad diameter	125 ± 2 μ m	125 ± 2 μ m
Coating diameter	155 ± 5 μ m	155 ± 5 μ m
Clad non-circularity	$< 2.0\%$	$< 2.0\%$
Coating concentricity	$\geq 80\%$	$\geq 80\%$
Core/clad offset	≤ 1.0 μ m	≤ 1.0 μ m
Coating/Buffer Descriptions		
Coating material	Hermetic Carbon/PYROCOAT	Hermetic Carbon/PYROCOAT
Operating temperature	-65 to +300°C	-65 to +300°C
Mechanical and Testing Data		
Short-term bend radius	≥ 4 mm	≥ 4 mm
Long-term bend radius	≥ 4 mm	≥ 4 mm
Proof test level	≥ 200 kpsi (1.38 GPa)	≥ 200 kpsi (1.38 GPa)
Product Description Code	SMT-A1310JZ	SMB-D1310JZ
Order by Part Number	BF057-17	F9001-01



Drawing not to scale

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